

Reconstruction and Analysis of Pulsed Thermographic Data

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In recent years acceptance of pulsed thermography as a technique for nondestructive evaluation has grown considerably. In its most widely used form, a target area is heated with a light pulse from a flash lamp and the surface temperature image, acquired with an infrared camera, is viewed to reveal areas of anomalous cooling due to subsurface discontinuities in the sample's thermal properties. However, it is possible to extract a significant amount of quantitative information, including thickness, defect depth and thermal diffusivity from the data sequence acquired from the infrared camera. The key to quantitative analysis is consideration of the entire time response of each pixel to the flash stimulation (as opposed to consideration of individual 2-dimensional images in the cooling sequence). A process for real time reconstruction of the response of each signal has been developed in order to allow sensitive discrimination between signal events associated with true subsurface interactions and those associated with noise or cooling phenomena other than heat conduction. The reconstructed data allows analysis of time derivatives of the response of each pixel, so that subtle signal changes (which would normally be masked by noise or artifacts) and the precise times at which they occur can be measured, and correlated to thermophysical properties.